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EXAMINER	
ROSS, JOHN M	

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

PRG

Office Action Summary	Application No. 09/547,034	Applicant(s) NUN ET AL.	
	Examiner John M Ross	Art Unit 2188	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 January 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 May 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Information Disclosure Statement

1. The Information Disclosure Statement(s) received 14 January 2002 has been considered. Please see attached PTO-1449(s).

Drawings

2. The drawings filed on 15 May 2001 have been approved by the Examiner.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 31-46 and 62-63 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

While being enabling for the generation of a hash address, the specification does not reasonably provide enablement for the generation of a "white" hash address.

It may be understood from the specification that "white hashing" of tuples that are in close proximity or differ minimally, should result in a uniform distribution of the hashed values throughout the full range of possible hashed values (Page 10, line 22 to page 11, line 2; page 20, line 24 to page 21, line 4). However, it is unclear by what measure the tuples are considered to be close in proximity. For example, the numerical equivalents of the tuples might differ by a

small value. Alternatively, a subset of corresponding fields might differ by a small value, but the numerical equivalents of the tuples might differ by a large value. In either case, a definition of what constitutes close in proximity or minimally different is not supplied.

Moreover, it is well known in the art that the uniformity of a hashing function may depend strongly on the range of inputs to the function and the frequency of these inputs. The expected inputs are not specified.

From Figure 3, it may be understood that the element labeled "CRC Block" corresponds to the white hashing function of the claims. This is presumed to perform a cyclic-redundancy-check calculation, however a generating polynomial is not specified.

Therefore, lacking a definition of what constitutes tuples that are in close proximity, the expected range and frequency of the inputs, and a generating polynomial for the CRC block, one skilled in the art could not make and use the "white hashing" function found in claims 31 and 39 without undue experimentation.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-30,32-33,40-41 and 47-61 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. The term "significantly smaller" in claims 1,16 and 47 is a relative term which renders the claims indefinite. The term "significantly smaller" is not defined by the claims, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Although M may be understood to be less than N, neither the absolute nor relative magnitude of their difference can be ascertained.

6. The term "significantly larger" in claims 32-33 and 40-41 is a relative term which renders the claims indefinite. The term "significantly larger" is not defined by the claims, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Regarding claims 32 and 40, although X may be understood to be larger than Y, neither the absolute nor relative magnitude of their difference can be ascertained.

Regarding claims 33 and 41, although X may be understood to be larger than Z, neither the absolute nor relative magnitude of their difference can be ascertained.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 31-46 and 62-63 are rejected under 35 U.S.C. 102(e) as being anticipated by Liao (US 6,185,208).

Liao discloses a hash function operating on the combination of an IP address and port number (i.e. a tuple) in which the 4 bytes comprising the IP address and the 2 bytes of the port number are reduced using a series of consecutive exclusive-OR operations on the bytes (Column 8, lines 9-14; equation 1). According to the associative property of the exclusive-OR operation,

the expression of equation 1 can be interpreted as in claims 31-46 and 62-63 to perform a hashing function on a 48-bit tuple according to the following steps:

a) splitting the tuple comprising the 48 bits of IP_1,IP_2,IP_3,IP_4,P_1 and P_2 into a first range comprising the 40 bits of IP_1,IP_2,IP_3,IP_4 and P_1, and a second range comprising the 8 bits of P_2;

b) applying an exclusive-OR hash function to the first range to generate an 8-bit hash address; and

c) creating an 8-bit hash address by combining the results of the hash of the first range with the second range of 8-bits using a Boolean operator.

Applying the nomenclature of the claims to the above steps of Liao, N=48, X=40, Y=8 and Z=8. Therefore, as in claims 32 and 40 X is larger than Y, and as in claims 33 and 41 X is larger than Z.

As in claims 35 and 43, Liao discloses that the Boolean operator is an exclusive-OR.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-30 and 47-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (APA) (Instant application) in view of Lakshman ("High-speed policy-based packet forwarding using efficient multi-dimensional range matching", ACM SIGCOMM Computer Communication Review, vol. 28, No. 4, 1998, pp. 203-214).

As in claims 1-30 and 47-61, APA describes a commonly used system for the storing and look-up of tuples that comprises a hash address generator for mapping a plurality of tuples to a smaller plurality of hash addresses (Page 5, line 20 to page 6, line 6).

As in claims 1-30 and 47-61, APA describes this system further comprising a memory for storing the tuples, where the memory is addressed by the hash addresses and each hash address corresponds to a bucket that contains a plurality of memory entries called slots, where each slot holds one tuple (Page 5, line 24 to page 6, line 2).

APA does not teach a comparison unit to match incoming tuples to stored tuples, wherein an associated process flow information is output if a match is found, and wherein a new entry is created in the hash table for the incoming tuple if a match is not found, as required by claims 1-30 and 47-61.

Lakshman teaches a traditional flow-cache architecture for packet classification in which incoming headers (i.e. tuples) are analyzed and when the header identifies a new flow, the header together with an associated action that must be applied to all packets in the flow (i.e. process flow information) are inserted in a hash table (Page 204, section 2.1, paragraph 1).

Lakshman further teaches that when subsequent packets in the flow arrive, the corresponding action is determined from the hash table (Page 204, section 2.1, paragraph 1). It is apparent in the teachings of Lakshman that determination of a new flow or the corresponding action for an existing flow requires a comparison unit to match incoming tuples with stored tuples, and that such a determination necessarily requires that the stored action (i.e. process flow information) be output if a match is found.

Lakshman also teaches that packet classification by parsing packet headers is a key mechanism for providing differentiated services to Internet users with widely varying requirements (Page 203, Abstract, paragraph 1).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to store tuples and their associated process flow information in a hash table, compare incoming tuples to stored tuples, output associated process flow information if a match is found, and create a new entry in the hash table if a match is not found as taught by Lakshman, in the system described by APA in order to provide the key mechanism for providing differentiated services to Internet users as taught by Lakshman.

11. Claims 2,7-15,17,22-30,48 and 53-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (APA) (Instant application) in view of Lakshman ("High-speed policy-based packet forwarding using efficient multi-dimensional range matching", ACM SIGCOMM Computer Communication Review, vol. 28, No. 4, 1998, pp. 203-214) as applied to claims 1,16 and 47 above, and further in view of Spinney (US 5,414,704).

APA and Lakshman are relied upon for the teachings relative to claims 1,16 and 47 above.

APA further teaches that according to theory the best way of making sure that packets reach their desired destination is to use a full 104-bit tuple, which enables a precise description of the source and destination nodes, the input and output ports as well as the protocol used (Page 5, lines 8-13).

APA and Lakshman do not teach the use of a content addressable memory (CAM) to store overflowing tuples and their corresponding flow information when the tuple cannot be stored in memory as required by claims 2,7-15,17,22-30,48 and 53-61.

APA and Lakshman also do not teach that the memory and CAM are searched in parallel as required by claims 12,27 and 58.

Spinney teaches a system for address lookup used in data packet communications where source and destination addresses are stored as entries in a hash table, where that hash table is organized as a plurality of buckets, and each bucket has a plurality of slots for storing the entries (Fig. 1A, element 21; Fig. 8; column 3, lines 3-10; column 15, lines 19-36). Spinney further teaches that when the network is initialized or reconfigured, there is a non-zero probability that the slots of a hash bucket will become full such that a new entry cannot be stored in the table, in which case the overflowing entry is stored in a CAM (Column 3, lines 23-27; column 16, lines 32-40).

Although the hash table entries of Spinney do not include flow information, the essence of his teaching is that overflowing hash table entries may be stored in a CAM. Likewise, the essence of the limitations recited in claims 2,7-15,17,22-30,48 and 53-61 is understood to be the storing of overflowing hash table entries in a CAM.

Spinney also teaches that the hash table in memory and the CAM are searched in parallel, thereby avoiding additional cost in time or additional circuitry (Column 16, lines 15-19 and 42-46).

Regarding claims 2,7-15,17,22-30,48 and 53-61, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to store overflowing hash table

entries (e.g. tuples and their corresponding flow information) in a CAM as taught by Spinney, in the system made obvious by the combination of APA and Lakshman, in order to solve the overflow problem created by the non-zero probability that the slots of a hash bucket will become full during network initialization or reconfiguration as taught by Spinney.

Regarding claims 13-15,28-31 and 59-61, incorporating the rationale in the rejection of claims 2,17 and 48 above, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use a tuple larger than 96-bits as taught by APA in order to enable a precise description of the source and destination nodes, the input and output ports as well as the protocol used, thereby making sure that packets reach their desired destination as taught by APA.

Regarding claims 12,27 and 58, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant to search the hash table in memory and the CAM in parallel as taught by Spinney, in the system made obvious by the combination of APA and Lakshman, in order to avoid additional cost in time or additional circuitry as taught by Spinney.

Regarding claims 14-15,29-30 and 60-61, although the combination of APA, Lakshman and Spinney does not teach hashing on the first 96 bits of the tuple, such limitations are merely a matter of design choice. The combination APA, Lakshman and Spinney teaches the use of a hashing function to transform an input tuple to a hashed address. The limitations in claims 14-15,29-30 and 60-61 of the instant application do not define a patentably distinct invention over the combination of APA, Lakshman and Spinney since both are directed toward generating a uniform distribution of hashed addresses from the input tuples. As it is well known in the art that the uniformity of a hashing function may depend strongly on the range of inputs to the function

and the frequency of these inputs, and because neither the instant application nor the combination of APA, Lakshman and Spinney provide specific details on this parameter, and the instant application provides no specific details concerning the hashing function, the number of bits used in the hashing function is inconsequential as a whole as it may be presumed that any number of choices might yield an acceptable result. Therefore, to use the first 96 bits would have been an obvious design choice to one of ordinary skill in the art at the time of invention by applicant.

Regarding claims 15,30 and 61, although the combination of APA, Lakshman and Spinney does not teach the use of three 32-bit comparators and standard 16 or 32-bit wide memories, such limitations are merely a matter of design choice. The combination of APA, Lakshman and Spinney teaches the use of a comparison unit and memory to compare and store tuples. The limitations in claim 15,30 and 61 of the instant application do not define a patentably distinct invention over the combination of APA, Lakshman and Spinney since both are directed toward matching incoming tuples with tuples stored in memory. The widths and groupings of the particular comparators and memories are inconsequential as long as the comparison and storage can be made on a selection of bits which are sufficient to guarantee that a tuple does not match the wrong hash bucket or the wrong slot in a hash bucket. Therefore, to use three 32-bit comparators and standard 16 or 32-bit wide memories would have been an obvious design choice to one of ordinary skill in the art.

12. Claims 3,18 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (APA) (Instant application) in view of Lakshman ("High-speed policy-based packet forwarding using efficient multi-dimensional range matching", ACM

SIGCOMM Computer Communication Review, vol. 28, No. 4, 1998, pp. 203-214) as applied to claims 1,16 and 47 above, and further in view of Chaudri (US 6,275,861).

APA and Lakshman are relied upon for the teachings relative to claims 1,16 and 47 above.

APA and Lakshman do not teach that the process flow information stored in the memory comprises a flow identification number as required by claims 3,18 and 49.

Chaudri teaches a system for identifying flows in a data system where the process flow information is stored in a hash table in memory, and this information comprises a flow identifier (Column 3, lines 50-52; column 4, lines 45-47; Fig. 6; column 4, lines 39-63). Chaudri also teaches that multiple flows may be associated with a common or default flow identifier, which reduces the number of search table entries that must be maintained (Column 3, lines 58-61; column 4, lines 53-54; column 6, lines 9-13).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to store the process flow information of the system made obvious by the combination of APA and Lakshman, in the form of a flow identifier as taught by Chaudri, considering the similarity in the nature of the problems to be solved and the well-known practice in the art of using indirection where information is represented by an index or pointer, as in the flow identifier taught by Chaudri, thereby allowing the flexibility of one-to-one or many-to-one (such as for a default flow processing as taught by Chaudri) correspondence between flows and their associated processing information, as well as allowing updates to flow processing information without disturbing the stored flow indentifiers or interrupting the flow identifier search process.

13. Claims 4-5,19-20 and 50-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (APA) (Instant application) in view of Lakshman ("High-speed policy-based packet forwarding using efficient multi-dimensional range matching", ACM SIGCOMM Computer Communication Review, vol. 28, No. 4, 1998, pp. 203-214) as applied to claims 1,16 and 47 above, and further in view of Kerr (US 6,590,894).

APA and Lakshman are relied upon for the teachings relative to claims 1,16 and 47 above.

APA and Lakshman do not teach that the process flow information stored in the memory can be updated as required by claims 4,19 and 50, nor do they teach that the process flow information stored in the memory can be deleted as required by claims 5,20 and 51.

Kerr teaches a system for processing flows in a data system where the process flow information is stored in a flow cache (i.e. hash table) in memory (Fig. 3; column 4, lines 11-14; column 6, lines 36-53), and this information comprises routing information, access control information, special treatment information and accounting information for packets in the flow (Column 6, lines 54-67). Kerr also teaches that the accounting portion of the process flow information in the memory may be updated (Column 5, lines 13-18) and that this information may be used by interested parties to diagnose actual or potential network problems (Column 8, line 66 to column 9, line 7), and that flows which are no longer valid due to timeouts, changes to "next hop" information or changes in access control lists may be deleted (Column 3, lines 48-51; column 5, line 54 to column 6 line 31).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to update and delete process flow information as taught by Kerr, in the system made

obvious by the combination of APA and Lakshman, in order to supply accounting information related to a flow to interested parties for diagnosis of network problems, and to remove information from the hash table for flows that are no longer valid due to timeouts and changes to "next hop" information or access control lists as taught by Kerr.

14. Claims 6,21 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (APA) (Instant application) in view of Lakshman ("High-speed policy-based packet forwarding using efficient multi-dimensional range matching", ACM SIGCOMM Computer Communication Review, vol. 28, No. 4, 1998, pp. 203-214) as applied to claims 1,16 and 47 above, and further in view of Thomas (A User Guide to the Unix System, Rebecca Thomas, et al, 1985).

APA and Lakshman are relied upon for the teachings relative to claims 1,16 and 47 above.

APA and Lakshman do not teach a kill-process command by which a search for an entry in the memory may be ceased as required by claims 6,21 and 52.

Thomas teaches termination of a process via a kill command utilized for circumstances where an executing process does not need to be run or may not be functioning correctly (Page 151, paragraph 1).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to incorporate a kill-process command as taught by Thomas, in the system made obvious by the combination of APA and Lakshman, for the purpose of terminating an executing search for an entry in the memory in the circumstance where the search process does not need to be run or is not functioning correctly as taught by Thomas.

15. Claims 7,22 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (APA) (Instant application) in view of Lakshman ("High-speed policy-based packet forwarding using efficient multi-dimensional range matching", ACM SIGCOMM Computer Communication Review, vol. 28, No. 4, 1998, pp. 203-214), and further in view of Spinney (US 5,414,704) as applied to claims 2,17 and 48 above, and further in view of Chaudri (US 6,275,861).

APA, Lakshman and Spinney are relied upon for the teachings relative to claims 2,17 and 48 above.

APA, Lakshman and Spinney do not teach that the process flow information stored in the CAM comprises a flow identification number as required by claims 7,22 and 53.

It is recognized that the CAM merely serves to store overflowing hash table entries and that otherwise its purpose in the system is identical to the hash table stored in memory, which is the storage and retrieval of tuples and process flow information for packet classification.

Therefore, claims 7,22 and 53 are rejected under the same rationale used in the application of Chaudri for the rejection of claims 3,18 and 52 above.

16. Claims 8-9,23-24 and 54-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (APA) (Instant application) in view of Lakshman ("High-speed policy-based packet forwarding using efficient multi-dimensional range matching", ACM SIGCOMM Computer Communication Review, vol. 28, No. 4, 1998, pp. 203-214), and further in view of Spinney (US 5,414,704) as applied to claims 2,17 and 48 above, and further in view of Kerr (US 6,590,894).

APA, Lakshman and Spinney are relied upon for the teachings relative to claims 2,17 and 48 above.

APA, Lakshman and Spinney do not teach that the process flow information stored in the CAM can be updated as required by claims 8,23 and 54, nor do they teach that the process flow information stored in the CAM can be deleted as required by claims 9,24 and 55.

It is recognized that the CAM merely serves to store overflowing hash table entries and that otherwise its purpose in the system is identical to the hash table stored in memory, which is the storage and retrieval of tuples and process flow information for packet classification.

Therefore, claims 8-9,23-24 and 54-55 are rejected under the same rationale used in the application of Kerr for the rejection of claims 4-5,19-20 and 50-51 above.

17. Claims 10,25 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (APA) (Instant application) in view of Lakshman ("High-speed policy-based packet forwarding using efficient multi-dimensional range matching", ACM SIGCOMM Computer Communication Review, vol. 28, No. 4, 1998, pp. 203-214), and further in view of Spinney (US 5,414,704) as applied to claims 2,17 and 48 above, and further in view of Thomas (A User Guide to the Unix System, Rebecca Thomas, et al, 1985).

APA, Lakshman and Spinney are relied upon for the teachings relative to claims 2,17 and 48 above.

APA, Lakshman and Spinney do not teach a kill-process command by which a search for an entry in the memory may be ceased as required by claims 10,25 and 56.

It is recognized that the CAM merely serves to store overflowing hash table entries and that otherwise its purpose in the system is identical to the hash table stored in memory, which is the storage and retrieval of tuples and process flow information for packet classification.

Therefore, claims 10,25 and 56 are rejected under the same rationale used in the application of Thomas for the rejection of claims 6,21 and 52 above.

18. Claims 11,26 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (APA) (Instant application) in view of Lakshman ("High-speed policy-based packet forwarding using efficient multi-dimensional range matching", ACM SIGCOMM Computer Communication Review, vol. 28, No. 4, 1998, pp. 203-214), and further in view of Spinney (US 5,414,704) as applied to claims 2,17 and 48 above, and further in view of Sternberger (US 4,788,656).

APA, Lakshman and Spinney are relied upon for the teachings relative to claims 2,17 and 48 above.

APA, Lakshman and Spinney do not teach the generation of a trap (i.e. interrupt) when the search memory and CAM are full as required by claims 11,26 and 57.

Sternberger teaches a memory (Fig. 4, elements 52 and 54), where an interrupt is generated when the memory is full, and that the interrupt is received by a host processor that takes appropriate action to avoid lost data (Column 8, lines 2-12).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to incorporate the memory-full interrupt of Sternberger in the system made obvious by the combination of APA, Lakshman and Spinney in order to allow a processor to take appropriate action to avoid lost data.

19. Claims 36-38 and 44-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liao (US 6,185,208) in view of applicant's admitted prior art (APA) (Instant application).

The rationale in the rejection of claims 31 and 39 under 35 U.S.C. 102(e) above is incorporated herein for the teaching of the hashing function.

Liao does not teach that the number of bits N in the input tuple is 104.

APA teaches that according to theory the best way of making sure that packets reach their desired destination is to use a full 104-bit tuple, which enables a precise description of the source and destination nodes, the input and output ports as well as the protocol used (Page 5, lines 8-13).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use a tuple with a number of bits N equal to 104 as taught by APA in the hashing function of Liao in order to enable a precise description of the source and destination nodes, the input and output ports as well as the protocol used, thereby making sure that packets reach their desired destination as taught by APA.

20. Claims 34,36-38,42,44-46 and 62-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liao (US 6,185,208).

The rationale in the rejection of claims 31-33,35,39-41 and 43 under 35 U.S.C. 102(e) above is incorporated herein for the teaching of the hashing function.

Regarding claims 34,42,62 and 63, although Liao does not specifically disclose the use of an "OR" or "AND" Boolean operator in step c) above, such limitations are merely a matter of design choice and would have been obvious in the system of Liao. Liao teaches the use of an exclusive-OR Boolean operator in step c) above. The limitations in claims 34,42,62 and 63 of

the instant application do not define a patentably distinct invention over Liao since both are directed toward generating hashed addresses from input tuples using identical steps. As it is well known in the art that the effectiveness of a hashing function (e.g. producing a uniformly distributed output range) may depend strongly on the range of inputs to the function and the frequency of these inputs, and because neither the instant application nor Liao provide specific details on this parameter, and the instant application provides no specific details concerning the hashing function, the Boolean operator used in step c) of the hashing function is inconsequential as a whole as it may be presumed that any Boolean operator might yield an acceptable result.

Therefore, to use an "OR" Boolean operator as in claims 34 and 42, or to use an "AND" Boolean operator as in claims 62 and 63 would have been obvious design choices to one of ordinary skill in the art at the time of invention by applicant.

Regarding claims 36-38 and 44-46, although Liao does not teach that N=104, X=96, Y=8, Z=20 and M=20, such limitations are merely a matter of design choice and would have been obvious in the system of Liao. Liao may be interpreted to teach that N=48, X=40, Y=8, Z=8 and M=8. The limitations in claims 36-38 and 44-46 of the instant application do not define a patentably distinct invention over Liao since both are directed toward generating hashed addresses from input tuples using identical steps. As it is well known in the art that the effectiveness of a hashing function (e.g. producing a uniformly distributed output range) may depend strongly on the range of inputs to the function and the frequency of these inputs, and because neither the instant application nor Liao provide specific details on this parameter, and the instant application provides no specific details concerning the hashing function, the number of bits N in the tuple, the subdivision in step a) of these bits into two parts comprising X and Y

bits, the number of bits Z in the intermediate result of step b) and the number of bits M in the result of step c) are inconsequential as a whole as it may be presumed that any number of values for these parameters might yield an acceptable result.

Therefore, to use an OR Boolean operator as in claims 34 and 42, or to use an AND Boolean operator as in claims 62 and 63 would have been obvious design choices to one of ordinary skill in the art at the time of invention by applicant.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John M Ross whose telephone number is (703) 305-0706. The examiner can normally be reached on M-F 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mano Padmanabhan can be reached on (703) 306-2903. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

JMR

Reginald G. Bragdon
REGINALD G. BRAGDON
PRIMARY EXAMINER